

CITY OF LINCOLN, NEBRASKA, STANDARD SPECIFICATIONS

Chapter 25

ORNAMENTAL STREET LIGHTING

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CHAPTER 25

ORNAMENTAL STREET LIGHTING

25.00 GENERAL

The work covered in this chapter shall include the furnishing of certain materials and equipment and the installation of all necessary materials and equipment to provide an ornamental street lighting installation complete, in place, and ready for operation in accordance with the plans and these Specifications. No work shall be done on any electrical circuits without making sure the connection to the source of supply has been broken. Arrangements for clearance shall be made with the System Control Department of the Lincoln Electric System (LES).

The City will furnish the material and/or equipment listed in the Special Provisions. All other material, equipment, and labor required to provide an ornamental street lighting installation in accordance with the plans and these Specifications shall be furnished by the Contractor. Refer to the General Provisions and Requirements of the City of Lincoln Standards for procedures to be followed in handling City furnished materials and/or equipment.

All materials and equipment furnished by the Contractor shall be new and shall conform to the applicable standards of the National Electrical Manufacturers Association (NEMA), the Insulated Cable Engineers Association (ICEA), the International Municipal Signal Association (IMSA), the American Society for Testing Materials (ASTM), and the American National Standards Institute (ANSI). Installation of equipment shall conform to the requirements of the National Electrical Safety Code, and the ordinances of the City of Lincoln. Wherever reference is made in these Specifications to the codes or standards mentioned above, the reference shall be construed to mean the code or standard currently in effect.

Material shall be as specified on the plans and in these Specifications. Wherever manufacturer's catalogue numbers are used, that specific item is to be used unless approved equal material or other manufacturer's material is specifically authorized by the Engineer. The word "approved" means acceptable by the Engineer.

Before ordering any material, the Contractor shall submit to the Engineer for approval three (3) or more copies of the manufacturer's specifications and drawings for all of the equipment and materials indicated below. The City shall not be liable for any equipment or materials ordered or purchased by the Contractor prior to approval.

- Paint
- Poles
- Luminaires and Lamps
- Cables, Splicing and Termination Devices
- Conduits
- Fuseholders and Fuses
- Control Equipment, Breakers, Switches, Contractors, Relays
- Lightning Arrestors, Enclosures, etc.
- Brackets, Hardware, etc.
- Pull Boxes
- Wiring and Connection Diagrams of All Cabinets, Circuits
- Connectors

25.00 GENERAL (Continued)

The manufacturer's specifications and drawings shall include the brand name, any identifying numbers, required technical data, and any other information necessary for the Engineer's review and for procuring exact replacements of any and all equipment and material used on this project.

25.01 RELATED ITEMS SPECIFIED ELSEWHERE

Chapter 20 Construction for Utilities and Structures
Chapter 24 Traffic Signals and Street Lighting

25.02 ELECTRICAL CONDUIT

Electrical conduit shall be of the size and type shown on the plans. Quality and installation of electrical conduit shall be in accordance with Article 24.10 of these Specifications.

25.03 ELECTRICAL CONNECTORS

See Section 24.12.C of these Specifications.

25.04 SECONDARY FUSES AND FUSE HOLDERS

Secondary fuses for single luminaire circuits or in street light poles shall be Buss-Type KTK, 10 ampere or equal. Secondary fuses for multiple luminaire circuits shall be Buss-Type KTK, 30 ampere. Fuse holders shall be Buss-type HEB.

25.05 GROUND RODS

Ground rods shall be of high strength steel rod with a chemically bonded copper covering to provide high conductivity and prevent electrolytic action. Ground rods shall be at least one-half inch (1/2") in diameter and ten feet (10') in length. Ground rods shall be in compliance with the International Municipal Signal Association Specification No. 62-1956. Ground wires shall be connected to ground rods with one-piece nonferrous clamps which employ set screws as tightening devices. Connections to ground rods need not be taped.

25.06 POLES

A. EMBEDDED STEEL POLES

1. General

Poles shall conform in detail to the requirements set forth in this Specification and as shown on the plans. Each pole shall consist of a steel shaft, grounding terminal, wire inlet, hand hole and hand hole cover.

The following criteria shall be considered in the design of these poles:

25.06 POLES (continued)

- a. Total weight of each luminaire - 40 pounds.
Effective projected area for each luminaire shall be 3 square feet.
- b. Wind loads (wind velocity with gust factor is 104 MPH shall be 23.5 pounds per square foot on projected area of luminaires and pole sections.
- c. Ice loads (unit weight of ice equals 56 pounds per cubic foot) shall be assumed 1 inch of ice loading shall be assumed on the horizontal projection of all exposed surfaces.
A ½" radial ice coating shall be assumed on the vertical projection of all exposed surfaces.

2. Shaft

The shaft shall be of steel and shall be a continuously tapered tube fabricated from not less than No. 11 manufacturer's gauge thickness, best grade steel. The shaft shall have only 1 longitudinal welded joint and shall be free of intermediate horizontal joints or welds. Only 1 length of sheet steel shall be used which shall be formed into a continuously tapered shaft having a taper of approximately 0.14 inches per foot. The shaft shall then be cold rolled under enough pressure to flatten the weld and increase the physical characteristics of the shaft so that the metal will have a minimum guaranteed yield strength of 48,000 psi.

The cold rolling process shall form a round shaft approximately 23 feet in length with a top outside diameter of approximately 3 inches and a bottom diameter of approximately 6". A 3" by 5" handhole with removable cover plate shall be centered approximately 18" above the ground line of the pole.

A grounding nut for accommodating a ½" 13 UNC threaded bolt shall be provided on the inside of the shaft so as to be easily accessible from the handhole opening.

The overall length of the shaft shall be such that the luminaire specified has its light center located per plan mounting height above the ground when mounted on the pole with the base of the pole to be a minimum of 4' below grade.

A wire opening with a minimum diameter of one-and-one-half inches (1 ½") shall be provided in the shaft. It shall be a grommited, smooth surface opening to prevent damage to wire being drawn through the hole. The opening shall be approximately 24 inches below the ground line.

3. Painting

After all welds have been completed on the pole shaft, it shall be thoroughly cleaned of all loose scale and other foreign material, hot dip galvanized and finish painted at the factory. Care is to be taken during shipping and installation to protect the finish from any cuts or scrapes..

4. Modifications

The Contractor shall submit to the Engineer for approval the name of the manufacturer and the type of pole he proposes to furnish. The Contractor or his representatives shall make no field modifications on any pole, or part thereof, without the written permission of the Engineer.

Modifications shall be construed to mean any drilling, filing, tapping, cutting, bending, or any other operation that will change the physical, mechanical, or architectural qualities of the pole.

B. EMBEDDED FIBERGLASS POLES

1. General

The pole shall be hollow and nonporous, constructed of nonconductive fibrous glass and polyester resin. The pole shall be inert to soil chemicals, smog by-products, insecticides, herbicides, animal urine, mild acids and alkalis, deicing salts and saltwater. The surface finish shall be smooth.

The pole shall not be affected by ultraviolet radiation or weathering to the extent that no visible checking, chalking, deterioration or change of strength will occur during the normal life of the pole. The pole shall also be free from degradation by freeze-thaw cycles. The pole shall not support combustion.

2. Dimensions

a.	Overall Length	23 feet Nominal
b.	Burial Depth	4 feet Minimum
c.	Mounting Height	Per plan to light center of luminaire
d.	Handhole and Cover	2.5 inch diameter round, 18 inches above grade
e.	Alternate Handhole and Cover	2.5 to 3 inches by 5 inch oval
f.	Tenon Top	3 inches outside diameter by 3.5 inches long steel or molded
g.	Wire Entrance Hole	1 inch to 1.5 inches minimum grommited, 24 inches below grade
h.	Pole Butt	Approximately 7 inches diameter, square or non-symmetrical
i.	Taper	0.120 to 0.150 inches per foot of length

3. Weight: Not greater than 65 pounds

4. Color: Black or grey, as specified on the plans

5. Performance Criteria

In accordance with Section 25.06.A.1.a,b,c of the Article

The lateral breaking strength load in pounds of the pole at any point on the pole shall be equal to or exceed two and one-half times the total wind loading moment at the ground line of the pole, computed for the above criteria. The total wind loading moment shall include moment due to luminaire, moment due to pole, and moment due to luminaire resting on a maximum wind load deflected pole.

25.07 LUMINAIRES

Luminaires shall be supplied as directed on the plans.

25.08 LAMPS

Lamps shall meet ANSI Standards in all respects. Lamps shall be Clear High Pressure Sodium Vapor, Universal Burn type and the wattage as shown on the plans. All lamps shall be non-cycling and must pass TCLP (Toxic Characteristic Leaching Process) limits.

Performance Data:

Rated Average Life at 10 hr/start	24,000 hours
% Mean Lumens at 10 hr/start	90%
Warm-up Time	3-4 minutes
Restart Time	1 minute

Physical Description:

Base Designation	Mogul
Bulb Designation	E-23-1/2
Bulb Finish	Clear
Light Center Length	5 inches
Bulb Temperature Limitations (maximum)	400° C
Base Temperature Limitations (maximum)	210° C

Electrical Description:

Nominal Lamp Watts	70
Nominal Lamp Volts	52
Nominal Lamp Current	1.6 Amperes
Maximum Crest Factor	1.8

Starting Pulse Requirements:

Pulse Peak Voltage (minimum)	2500
Pulse Peak Voltage (maximum)	4000
Pulse Width	1 Microsecond (minimum) at 2250
Pulse Repetition	50 per second
Pulse Peak Current	0.2 Amperes (minimum)

25.09 ELECTRICAL CABLE

See Section 24.11.A.5 of these Specifications

25.10 PHOTOELECTRIC CONTROLS

See Section 24.23.5 of these Specifications

25.11 FERROUS HARDWARE

All ferrous metal used in line hardware items shall be hot dip galvanized in conformity with “Standard Specifications for Zinc Coating (Hot Dip) on Iron and Steel Hardware”, ASTM Designation A153-53. The grade of steel and part design shall conform to Edison Electric Institute (EEI) Specifications where applicable. All hardware items shall have a minimum strength capable of supporting the maximum load to which they may be subjected.

25.12 PULL BOXES

Pull boxes shall be installed at the locations shown on the plans. The Contractor may install, at his own expense, any additional pull boxes that may be desired to facilitate the work. The type and size of pull box shall be indicated and shall meet requirements of Article 24.01 of these Specifications.

25.13 GRADES

All work shall conform to Article 24.01 of these Specifications.

25.14 TRENCHING AND BACKFILLING

All cables, trenched or plowed, shall be 24 inches in depth on rear lot lines and 30 inches in depth on front and side lot lines. Cable route along the curb shall be centered approximately 5.5 feet from the sidewalk side of the curb unless otherwise specified on the plans.

All trenches shall be backfilled and compacted daily unless properly protected. All trenches for burial of electrical cable and conduit shall not exceed 6 inches in width.

The first four inches of backfill shall consist of finely pulverized earth and shall contain no broken glass, rocks, or other sharp material that might damage the cable. Where the cable enters conduit, care shall be taken to protect the cable as outlined elsewhere in these Specifications.

The remainder of the backfill material will normally be earth excavated from the trench unless such earth is water saturated or frozen. Backfill material shall be substantially dry, loose, clean earth free from rocks and debris. Excessively dry or excessively sandy material is not permitted.

Before backfilling, all standing water shall be removed from the trench. Tamping shall be done at no more than 12 inch backfill level intervals to ensure proper compaction throughout the depth of the void. The foot of the compressed air or hydraulic tamper to be used to compact the backfill shall be sized in accordance with the width of the trench. Hand tamping is not permitted. All excess backfill material shall be removed promptly from the site.

Directional boring may be used at Engineers/Contractors discretion.

25.15 RESTORING STREET SURFACES AND CONCRETE WORK

Improvements such as sidewalks, curbs, gutters, Portland cement concrete and asphaltic concrete pavement, bituminous surfacing, base material, and any other improvements removed, broken, or damaged by the Contractor shall be replaced or reconstructed in accordance with the applicable chapters of these Specifications.

25.16 INSTALLATION OF POLES

A. EMBEDDED STEEL POLES

Embedded steel poles shall be backfilled with a high density modified polyurethane foam. The Contractor shall coat the entire vertical pole butt surface with foam from base 1 foot below ground line. The poles shall be masked to 1 foot below the ground line to prevent splattering and provide a uniform edge.

All holes for poles shall be drilled or augered. The soil shall be removed from the holes mechanically or vacuumed. The diameter of the finished hole shall not exceed the pole diameter at ground line more than six inches (6") nor less than two inches (2"). Depths of holes shall be determined by embedment length requirements of the pole, but shall in no case be less than four feet (4').

In case of over-drilling, the holes shall be backfilled to proper depth with compacted soil. The Contractor shall take every precaution to prevent surface drainage from entering the holes.

A six inch (6") layer of crushed rock shall be placed in the base of each hole. The crushed rock shall have been sieved after crushing to remove excessive fines and shall be so graded to meet the following requirements.

Total retained on 1-1/2" sieve	0-5%
Total retained on 1/2" sieve	90-100%

A ground rod shall be set in undisturbed earth 24 inches from the outside edge of the augered pole with the top of the ground rod 12 inches below grade. A continuous ground wire shall connect the ground rod to the grounding lug on the pole.

Handholes shall be oriented so that they are opposite the direction of vehicle traffic on the side of the road at which the pole is installed.

Nylon slings shall be used to handle all poles to prevent damage to the paint. All poles shall be left clean after erection, and damaged paint shall be sanded and repainted.

A small section of 1" PVC conduit shall be used during backfilling application to assure access to the underground wire inlet after the backfilling process has been completed to allow installation of the underground wire thru the poly foam.

Poles shall be plumbed and held in stationary position for no less than 20 minutes (or as recommended by the foam manufacturer) after the foam has been applied. The masking shall be removed as soon as the foam expansion reaction has ceased. The remainder of the hole shall be backfilled with clean earth and tamped.

Application and use of the foam shall be in strict adherence to the manufacturer's instructions. A copy of the manufacturer's instructions shall be present on the job site and available to the Observer. The age of the polyurethane foam components shall not have exceeded the manufacturer's recommended shelf life under the conditions by which the manufacturer defines shelf life. After the recommended curing period, the foam shall have a core density of not less than 4.2 pounds per cubic foot and shall have a sheer strength not less than 38 p.s.i. and shall have a compressive strength not less than 75 p.s.i.

The foam shall be tested when required by the Engineer in accordance with ASTM D 2856/ANSI K 65.152; ASTM D 1623/ANSI K65.32; and ASTM D 1621/ANSI K65.31.

25.16 INSTALLATION OF POLES (continued)

B. FIBERGLASS POLES

Fiberglass poles shall be installed in the same manner as set forth in Article 25.16A, except that grounding shall be as specified in this Article and the use of polyurethane foam is optional.

An alternative to polyurethane foam backfill for fiberglass poles is earth backfill. Where earth backfill is used the diameter of the hole shall be sized in accordance with the diameter of the foot of the compressed air or hydraulic tamper to be used to compact the backfill. Hand tamping is not permitted. The distance between any point on the ground line of the pole to the perimeter of the hole shall be a minimum of 2 inches plus the diameter of the tamper foot, but not greater than the tamper foot diameter plus 6 inches.

Backfill material will normally be earth excavated from the hole unless such earth is water saturated or frozen. Backfill material shall be substantially dry, loose, clean earth free from rocks and debris. Excessively dry or excessively sandy material is not permitted.

Before backfilling, all standing water shall be removed from the hole. Crushed rock in accordance with Article 25.16.A shall be installed in the bottom of the hole. After the pole is plumbed and held fast in a true position, approved backfill material shall be installed in the voids between the pole and the hole perimeter. Tamping shall be done at not more than 12 inch backfill level intervals to ensure proper compaction throughout the depth of the void. After backfilling and tamping are completed, additional earth shall be banked around the ground line perimeter of the pole to a height of 3 inches. All excess backfill material shall be removed promptly from the site.

A ground rod shall be installed a minimum of 24 inches from the nearest edge of the augered hole and a minimum of 12 inches below final grade. A continuous ground wire shall connect the ground rod to the grounding lead in the luminaire by means of the wire opening of the pole shaft.

25.17 INSTALLATION OF LUMINAIRES

All luminaires shall be leveled by means of bubble level after installation and the refractor shall be properly oriented with respect to the street.

25.18 INSTALLATION OF CABLE AND CONDUIT

Conduit shall be installed in accordance with Article 24.10 of these Specifications.

Cable installed in conduits shall be installed in accordance with Article 24.11 of these Specifications.

Aerial cable shall be installed in accordance with Article 24.11 of these Specifications.

Direct burial cable shall be installed in a dug trench at a depth of 24 inches on rear lot lines and 30 inches on front and side lot lines unless obstructions interfere. Along the street the cable shall be installed approximately 5.5 feet from the sidewalk side of the curb unless otherwise specified. Use of an approved cable plow will also be permitted. In areas where trenching may permanently damage the health of mature plants, the boring procedure shall be required.

1 ½ inch Schedule 40 PVC conduit shall be installed under all existing paved roadways, sidewalks, or driveways that have to be crossed, unless otherwise specified.

25.18 INSTALLATION OF CABLE AND CONDUIT (continued)

The cable shall be laid in a single piece from the source to the pole top or from one pole top to the next. No splices shall be permitted in the underground section of the cable. All splices, when required or necessary, are to be made in the base of the pole or in the pull box.

The cable shall be handled with care to avoid nicks or abrasions to the sheath. Any section of the cable which the Engineer considers to be damaged shall be discarded.

Where necessary to clear permanent obstructions such as manholes, inlets, etc., the cable may be rerouted, but the Engineer shall approve of such rerouting.

All electrical connections shall be as shown on the plans. Care is to be given to ensure that all cable is installed within the designated easements.

The Contractor is responsible for notifying the property adjacent to any construction approximately one (1) week prior to doing work. The Lincoln Electric System will provide door hangers.

25.19 INSTALLATION OF PHOTOELECTRIC CONTROLS AND LAMPS

All photoelectric controls shall be seated securely in the twist-lock receptacle and oriented so the "eye" window faces north. Orientation shall be made by means of adjustments provided by the manufacturer.

Lamps shall not come in contact with any foreign materials or liquids.

The Contractor shall plainly record the installation dates on lamps and photocells in the spaces provided by the manufacturer.

25.20 POWER SUPPLY AND RISERS

Locations of power supplies are shown on the plans. The bottom 10' of power supply risers shall be 1 ½ inch) schedule 80 PVC or steel conduit unless otherwise specified and shall be mounted in accordance with Lincoln Electric System specifications. All steel risers shall be grounded. All pole risers shall be on stand off brackets provided by LES and can be picked up at the Lincoln Electric System store room. See LSP 83 for spacing detail. Power supplies from transformers or service pedestals shall be installed by the Contractor. Notify LES to make final connection

25.21 TREE TRIMMING

Authorized tree trimming shall be done according to the direction of the City Forester. After trimming, all brush shall be hauled away and the area cleared of leaves and small twigs. Where required by City regulations, the services of a licensed Arborist shall be employed for tree trimming.

25.22 SECONDARY CONNECTIONS

When all work has been completed and the luminaires are ready to be energized, the Contractor shall notify the Lincoln Electric System.

25.23 REMOVING AND RESETTING MAILBOXES

Where rural type mailboxes interfere with cable installation adjacent to the curb, these shall be removed and reset to their original location not more than two (2) days after removal. They must be available on the premises at all times in a position to receive mail. The Contractor shall make arrangements with the Post Office Station serving this area for details.

25.24 MEASUREMENT AND PAYMENT

Measurement and payment for ornamental street lighting is on a per unit basis in accordance with the General Conditions of the City of Lincoln Standards and Specifications.